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BOSTON UNIVERSITY RESEARCHERS REPORT NHL PLAYER DEREK BOOGAARD HAD EVIDENCE OF EARLY CHRONIC TRAUMATIC ENCEPHALOPATHY

AT A GLANCE

- **Derek Boogaard's brain was donated for study after his death at the age of 28.**
- **Boogaard had evidence of early CTE at the time of his death.**
- **CTE is a degenerative brain disorder associated with repeated brain trauma, including concussions and multiple subconcussive blows to the head, such as those found in contact sports.**

(BOSTON) – Researchers at the Boston University Center for the Study of Traumatic Encephalopathy (BU CSTE), a collaboration with the Sports Legacy Institute (SLI) and the Bedford (MA) Veterans Administration (VA) Medical Center, announced today that National Hockey League (NHL) player Derek Boogaard had evidence of early stages of Chronic Traumatic Encephalopathy (CTE), a neurodegenerative disease linked to repeated brain trauma, when he died May 13, 2011, at the age of 28.

Boogaard played left wing for the Minnesota Wild from 2005-2010 before playing for the New York Rangers during the 2010-2011 season. He was considered by many to be the toughest fighter in the NHL. In 277 NHL games, Boogaard scored three

goals, had 589 penalty minutes and reportedly participated in 61 regular season fights. He also reportedly participated in 174 career fights in professional hockey.

Boogaard had not played since Dec. 9, 2010, due to injuries sustained in a fight, including a reported concussion. His family reported he had “seen stars” in a game two weeks prior to his final game. Boogaard had been diagnosed with post-concussion syndrome twice, and his family believes he spoke of having his “bell rung” (a term athletes use for a mild concussion) at least 20 times, although he reported few of them to his team or medical staff. Boogaard dealt with drug addiction and exhibited abnormal behaviors, including emotional instability and problems with impulse control, along with short-term memory problems and disorientation, for two years prior to his death.

Boogaard was diagnosed with mild CTE by neuropathologist and CSTE co-director Ann McKee, MD, professor of neurology and pathology at BUSM and the director of the CTE brain bank located at the Bedford VA Medical Center. CTE can only be diagnosed by examining brain tissue post-mortem. Boogaard had evidence of early CTE in his cerebral cortex, although the severity of his brain changes was more advanced than most other athletes of similar age with CTE examined by Dr. McKee.

The association between Boogaard's brain pathology and his clinical symptoms, specifically the behavioral changes and memory problems he experienced in his last two years, is unclear. For example, his clinical symptoms occurred during the same time period he was exhibiting narcotic

abuse. CTE has been found in other deceased athletes who have died from overdoses or who had problems with substance abuse. It is unknown if the substance abuse is caused by the impulse control problems associated with CTE or if they are unrelated.

Dr. McKee found mild stages of CTE in former NHL players Rick Martin and Bob Probert. It is unclear if the degree of their pathology contributed to any clinical symptoms. More severe CTE was found in Reggie Fleming. Fleming, who died in 2009 at the age of 73 with dementia, displayed 30 years of worsening behavioral and cognitive difficulties and had advanced CTE.

“It is important not to over-interpret the finding of early CTE in Derek Boogaard,” said BU CSTE Co-Director and SLI Co-Founder Robert Cantu, MD. “However, based on the small sample of enforcers we have studied, it is possible that frequently engaging in fistfights as a hockey player may put one at increased risk for this degenerative brain disease.”

Added BU CSTE Co-Director and professor of neurology and neurosurgery at BUSM, Dr. Robert Stern, “Boogaard’s clinical history was complex, so it is unclear as to if or how much CTE contributed to his behavior, addiction or death. However, CTE appears to be a progressive disease in some individuals, so even if it was not directly affecting Boogaard’s quality of life and overall functioning before he died, it is possible it could have in the future.”

“Unfortunately this finding does not contribute to our knowledge of the risks of normal hockey play for most participants, as very few hockey players engage in as many fights as Boogaard,” said BU CSTE Co-Director and SLI Co-Founder Chris Nowinski. “Athletes and parents should know that anyone who experiences repetitive brain trauma may be at risk to develop CTE, but we are hopeful that risk is small in hockey.” Nowinski added that two other young non-NHL professional hockey players studied did not show signs of CTE at postmortem examination.

The VA CSTE Brain Bank contains more brains diagnosed with CTE than have ever been reported in the world combined. There are 99 specimens. McKee has completed the analysis of the brains of over 70 former athletes, and more than 50 have shown evidence of CTE, including 14 of 15 former NFL players, as well as college and high school football players, other hockey players, professional wrestlers and boxers. Early evidence of CTE has been found in individuals as young as 17. More than 500 living athletes have committed to donate their brain to the BU CSTE after death, including over a dozen former hockey players.

The Boogaard family requested that the diagnosis be made public at this time. A full report of Boogaard’s brain tissue analysis is embargoed pending publication in an academic medical journal.

The CSTE (www.bu.edu/cste/) was founded in 2008 and is the leading center in the world studying the long-term effects of repetitive brain trauma in sports and the military. The CSTE was created as a collaboration between Boston University (BU), Sports Legacy Institute (SLI) and the Department of Veterans Affairs (VA). Co-directors of the BU CSTE include Robert Cantu, MD, clinical professor of neurosurgery at BUSM; Ann McKee, MD, professor of neurology and pathology at BUSM and director of the VA CSTE Brain Bank; Chris Nowinski; and Robert Stern, PhD, professor of neurology and neurosurgery at BUSM. The mission of the CSTE is to conduct state-of-the-art

research of CTE, including its neuropathology and pathogenesis, clinical presentation, biomarkers, methods of diagnosing it during life, the genetics and other risk factors for CTE, and ways of preventing and treating this cause of dementia. The BU CSTE has received grants from the National Institutes of Health and the National Operating Committee on Standards in Athletic Equipment (NOCSAE), and has received an unrestricted gift from the NFL.

Sports Legacy Institute is a 501(c)(3) nonprofit corporation founded in 2007 to advance the study, treatment and prevention of the effects of brain trauma in athletes and other at-risk groups. SLI partnered with Boston University School of Medicine to form the Center for the Study of Traumatic Encephalopathy in 2008. (www.sportslegacy.org)

CSTE co-directors Cantu, McKee, Stern and Nowinski serve on the NFL Players Association Mackey/White Traumatic Brain Injury Committee. In addition, Cantu serves as a senior advisor to the NFL Head, Neck and Spine Committee.

Fight data from www.hockeyfights.com